May 24, 1932. H. D. HUNT 1,859,774

APPARATUS FOR FEEDING LIQUIDS

Filed Oct. 16, 1930

Fig. 2.

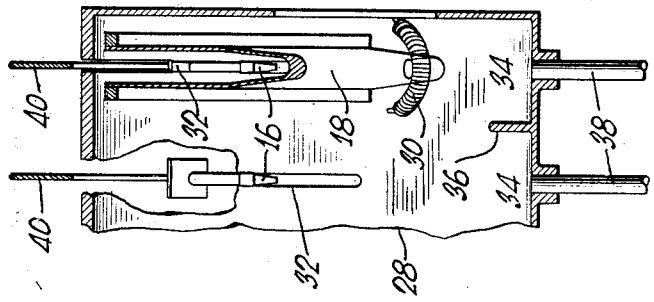
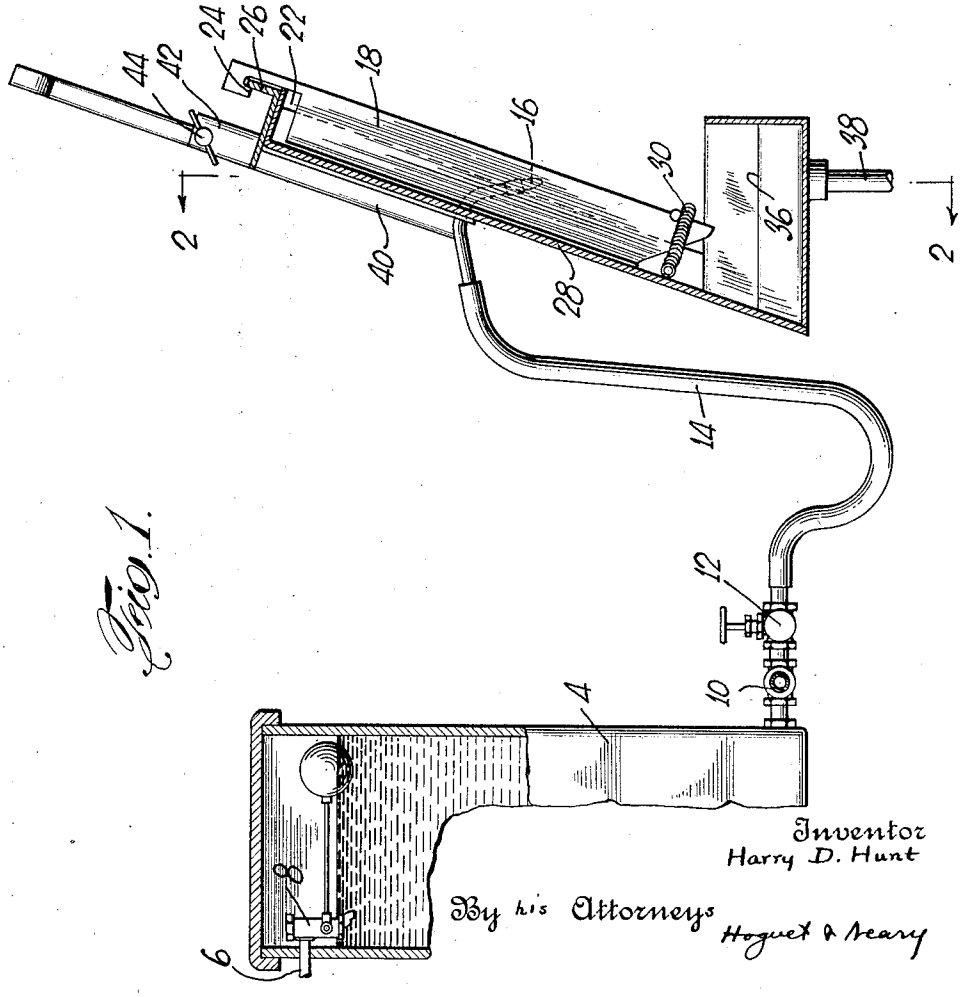


Fig. 1.



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UNITED STATES PATENT OFFICE

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APPARATUS FOR FEEDING LIQUIDS

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This invention relates in general to a device for feeding a small and regular amount of liquid continuously through a small orifice, and more particularly to such a device for continuously feeding a small and regular predetermined amount of a flotation agent to an ore pulp in a froth flotation process of concentrating ores.

In such a process, the ore in the form of an aqueous pulp is continuously subjected to aeration in the presence of froth flotation agents to form a froth containing the valuable portions of the ore. The froth is collected, thereby separating said values from the barren constituents of the ore.

In order to obtain the best results in this process, it is necessary to add the froth flotation agents continuously to the pulp in regular amounts proportioned to the quantity and character of ore under treatment.

Various devices have been used for adding these agents to the pulp but they have been unsatisfactory because they could not handle liquids of different viscosities and because they involved the use of mechanical devices, usually motor driven, composed of many moving parts which were expensive, quickly wore out, needed frequent repairing causing interruptions in the process, and were not adapted for feeding regular amounts, easily adjusted to the quantity and character of ore being treated.

An object of this invention is to produce a new and improved device of this type which will be economical and simple in construction and operation with a minimum of moving parts, thereby requiring a minimum of repairs and which will be accurate and easily regulated in operation.

The device comprises one or more nozzles having small orifices and connected to a constant level supply tank by one or more flexible conduits, the nozzles being adjustable so that the hydrostatic head acting to force the reagent therethrough may be regulated to regulate the rate of discharge of the reagent through the orifices.

Referring now to the drawings which illustrate a preferred form of my invention,

Figure 1 shows a more or less diagrammatic view of my apparatus, and

Figure 2 shows a section taken on line 2—2 of Figure 1 looking in the direction of the arrows with parts broken away and others omitted.

As shown in Figure 1, 4 comprises a small constant level supply tank for containing the liquid reagent. This tank is connected, by means of a pipe 6 entering the upper portion thereof, to a large supply or storage tank (not shown). The level of the reagent in tank 4 is controlled by a float valve 8 which controls the flow of the reagent thereinto from the pipe 6 aforesaid.

A header member 10 is connected to the tank 4 near the bottom thereof. One or more flexible conduits or tubes 14 are connected through suitable valves 12 to the header 10 at their lower ends and carry nozzles 16 at their upper ends. These nozzles have very small discharge orifices of definite area formed therein. While these orifices are exceedingly small, they and the conduits 14 are constructed to have an internal cross-sectional area which is large with respect to the volume of liquid to be fed therethrough per unit of time. This causes the velocity of the liquid passing through the device to be very low. It is well known that friction loss in a pipe is a function of the velocity of the liquid flowing therethrough. It is also well known, that variations in working temperatures vary the volume of a liquid passing through a pipe. However, in my device as constructed, the velocity of the liquid flowing therethrough is so low that even under a maximum head, the effects of friction and variations in the working temperatures will be negligible and may be disregarded.

Each nozzle enters and discharges into a removable elongated splash tube 18 slightly inclined to the vertical. Each splash tube is open on one side and has a cut-out portion 22 forming a hook 24 adapted to engage over an upwardly extending flange 26 formed on a standard 28. Springs 30 mounted on the standard are adapted to engage the lower ends of the splash tubes and hold them against the standard. The standard has a slot 32 in reg-

istry with the open side of each splash tube. Reservoirs 34 separated by partitions 36 are formed in the standard below the open ends of the respective splash tubes. A separate discharge pipe 38 leads from the bottom of each reservoir 34 to the point of introduction of the agent to allow the agent to flow in a separate stream from each reservoir to the material being treated.

The rate of feed of the agent may be adjusted to any desired amount. For this purpose, the nozzles 16 are secured to slides 40 slidably mounted in lugs 42 mounted on the support 28 and are secured in their adjusted positions by means of thumb screws 44 threaded through one of each pair of lugs.

In operation, the nozzles are adjusted by loosening the thumb screws 44 and moving the slides thereby moving the nozzles so that the orifices therein will be at a greater or lesser distance below the upper surface of the liquid in the tank, thereby adjusting the hydrostatic head tending to force the liquid through the orifices and regulating the flow therethrough. As the liquid flows from the orifices, it will hit the sides of the splash tubes and run gently into the reservoirs 34. As the liquid is drawn from the tank 4, the upper surface thereof will fall causing the float to open the valve and allow more liquid to flow into the tank, thereby maintaining the level constant and the head on the liquid flowing from the orifices of the nozzles constant for any given adjustment.

The device may be used with one nozzle only or with a plurality thereof and where a plurality are used, the pipes 38 leading from the reservoirs 34 may lead the liquid discharged from all the tubes into a single stream of pulp or the discharge from the different nozzles into different streams as desired.

When desired, the splash tubes 18 may be removed for cleaning thereof or of the nozzles and for calibration of the nozzles by substitution of graduated tubes therefor.

Thus, it will be seen that I have provided a feeder for liquids which is simple and economical to construct and to operate. It is entirely automatic and may be operated indefinitely as the float valve is the only moving part and its movement is so slight as to cause no appreciable wear. The device will feed accurately regulated amounts and will operate efficiently with any liquid that will flow.

While I have described my invention as used in a mineral flotation process, it is obvious that it may be used wherever it is desired to feed liquids in regular accurately measured amounts and is of general application. Obviously, various changes may be made in the details of construction of my device without departing from the scope of my invention as pointed out more particularly in the claims appended hereto.

I claim:

1. In a feeding device, a nozzle defining a discharge orifice and connected to a constant level supply tank, means for adjusting the orifice relatively to the level of a liquid in the tank, an inclined tube-like splash-preventing member into which the orifice discharges material, and a reservoir connected to the bottom of the tube-like member.

2. In a feeding device, an elongated tube-like member, a longitudinally extending slot in one side of said member, a nozzle extending through said slot into said member and connected to a constant level supply tank, a slide carrying said nozzle mounted outside of said member and movable longitudinally thereof to adjust the nozzle relatively to the level of a liquid in the tank.

3. In a feeding device, a standard, an elongated tube-like member detachably mounted on said standard, a longitudinally extending slot in the side of said member nearest to said standard, a slot in said standard opposing the slot in said member, a nozzle extending through said slots into said member, and connected to a constant level supply tank, a support for said nozzle adjustably mounted on the standard for adjusting the position of the nozzle in said slots and relatively to the level of a liquid in the tank.

4. In a device for feeding liquids, a supply tank, a nozzle defining an orifice connected thereto for discharging liquid downwardly, a splash-preventing member having a surface slightly inclined to the vertical extending below the nozzle and in the path of the liquid discharged therefrom, and means for adjusting the nozzle vertically in a plane parallel to the plane of said surface.

In testimony whereof I have signed my name to this specification this 8th day of October, 1930.

HARRY D. HUNT.